Geophysical Research Abstracts
Vol. 20, EGU2018-7565, 2018
EGU General Assembly 2018

Modelling the evolution of outlet glaciers in Amundsen Sea sector for the next 50 years

Jintao Lei, Shengkai Zhang, Fei Li, Wenhao Li, and Weifeng Hao
Chinese Antarctic Center of Surveying and Mapping, Wuhan University

Keeping draining a large fraction of the West Antarctic ice sheet into the Amundsen Sea, Thwaites, Pine Island, and other fast-flowing outlet glaciers are great contributors to sea level rise in Antarctica. Earlier observations and simulations all indicated that the Amundsen Sea Sector is experiencing an accelerated mass loss, with mass flux into the southern Pacific Ocean about 280±9 Gt/yr, which is comparable to that of the entire Greenland Ice Sheet into the Arctic Ocean. In this study, we use a Shelfy-Stream Approximation (SSA) model of Full-Stokes to simulate all the outlet glaciers in Amundsen sector over the next 50 years, and test the dynamics sensitivity in response to changes in surface mass balance (SMB), the position of calving front and ocean-induced basal ice shelf melting. Our results show that all tested glaciers experience an increase in velocity over the ice shelf for the next 50 years, and the change in speed will reach up to 100 km/yr on ice shelf, and can propagate several hundreds of kilometers inland. The changes in ice front position have an immediate effect on ice velocity, but scarcely impact the ice volume above floatation of the glacier. The basal melting under ice shelf is the largest climatic factor on ice dynamics, which leads to both ice velocity increase and ice volume loss. The changes in SMB do not affect the ice speed obviously, but leads to large variations in glacier volume above floatation. If all glaciers in our test are under the present-day conditions, the sea level rise caused by Thwaites, Pine Island, and other glaciers in our experimental area will be about 20 mm, 11 mm and 3 mm respectively in the next 50 years.